

Innovative Wastewater Options

Beyond Sewering

Bridgewater State College

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<http://www.uri.edu/ce/wq/>



National Decentralized Water Resources
Capacity Development Project



Creative Community Design and
Wastewater Management

University of Rhode Island Cooperative Extension
Kingston, Rhode Island
March 2004

Based on the report

Creative Community Design and Wastewater Management

View or download at:

**[www.ndwrcdp.org/
publications.cfm](http://www.ndwrcdp.org/publications.cfm)**

**With thanks to the National Decentralized
Water Resources Capacity Development
Project staff and review committee**



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Choosing a Wastewater Treatment System



Part One of a Series About Onsite W

And 3-volume set on Wastewater Treatment Systems

[www.uri.edu/ce/wq/mtp/html/
publications.html](http://www.uri.edu/ce/wq/mtp/html/publications.html)

Alternative Wastewater Treatment for Individual Lots



Part Two of a Series About Onsite Wastewater Treat

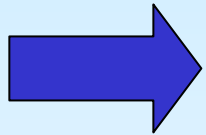
Based on Creative Community Design
Manual and funded by the Block Island
and Green Hill Pond Wastewater
Demonstration Project

A Creative Combination: Merging Alternative Wastewater Treatment with Smart Growth



Part Three of a Series About Onsite Wastewater Treatment Alternatives

Topics

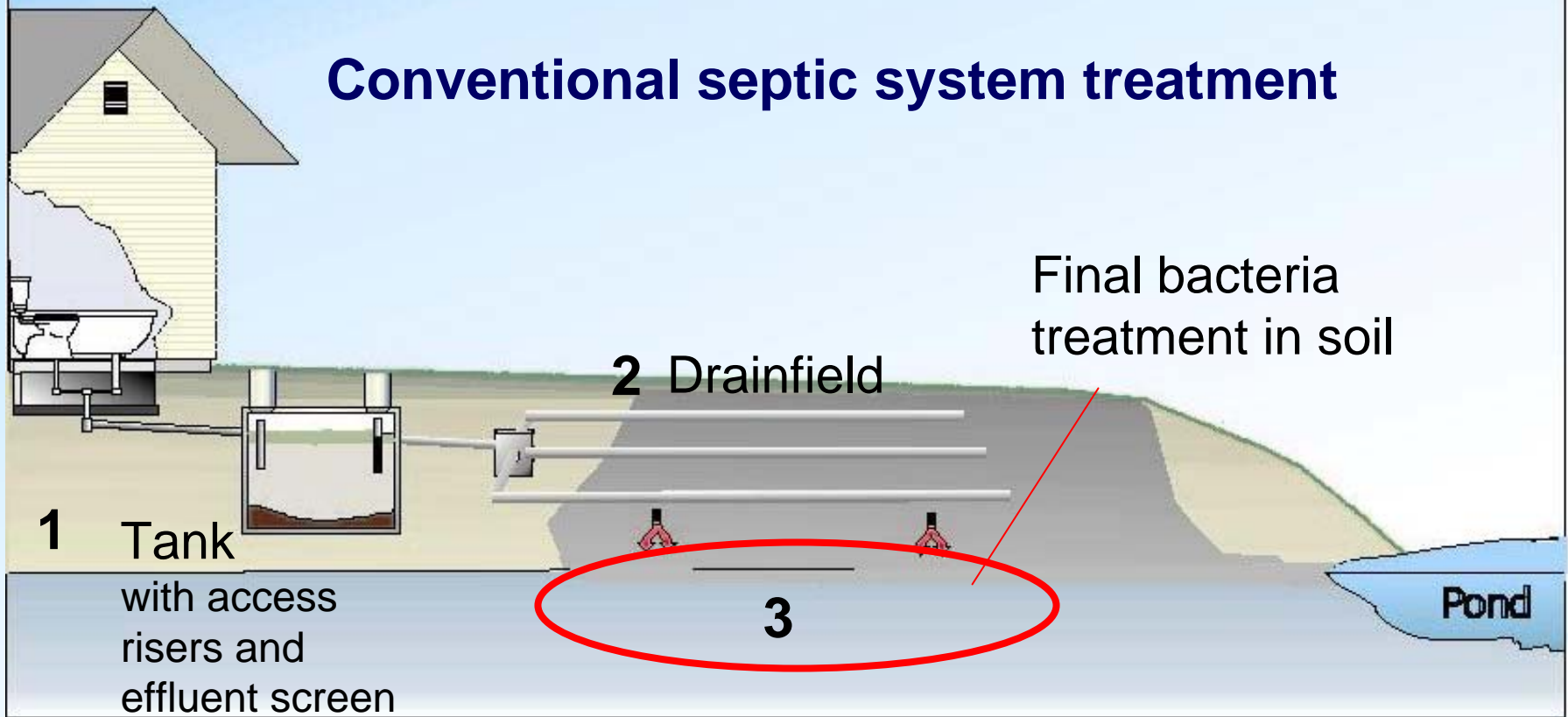


Overview of alternative technologies – siting, performance, O&M

Issues, trends and needs

Funding and Resources

Conventional septic system treatment



- 1. Primary treatment in tank with solids settling.**
- 2. liquid effluent flows to drainfield by gravity - “socially dosed”**
- 3. Soil below drainfield provides treatment of bacteria and phosphorus based on separation to groundwater and setbacks.**

Nitrogen is not removed - relies on low density for dilution

Raised “fill” or “mound” system – modification of a conventional system for marginal sites.



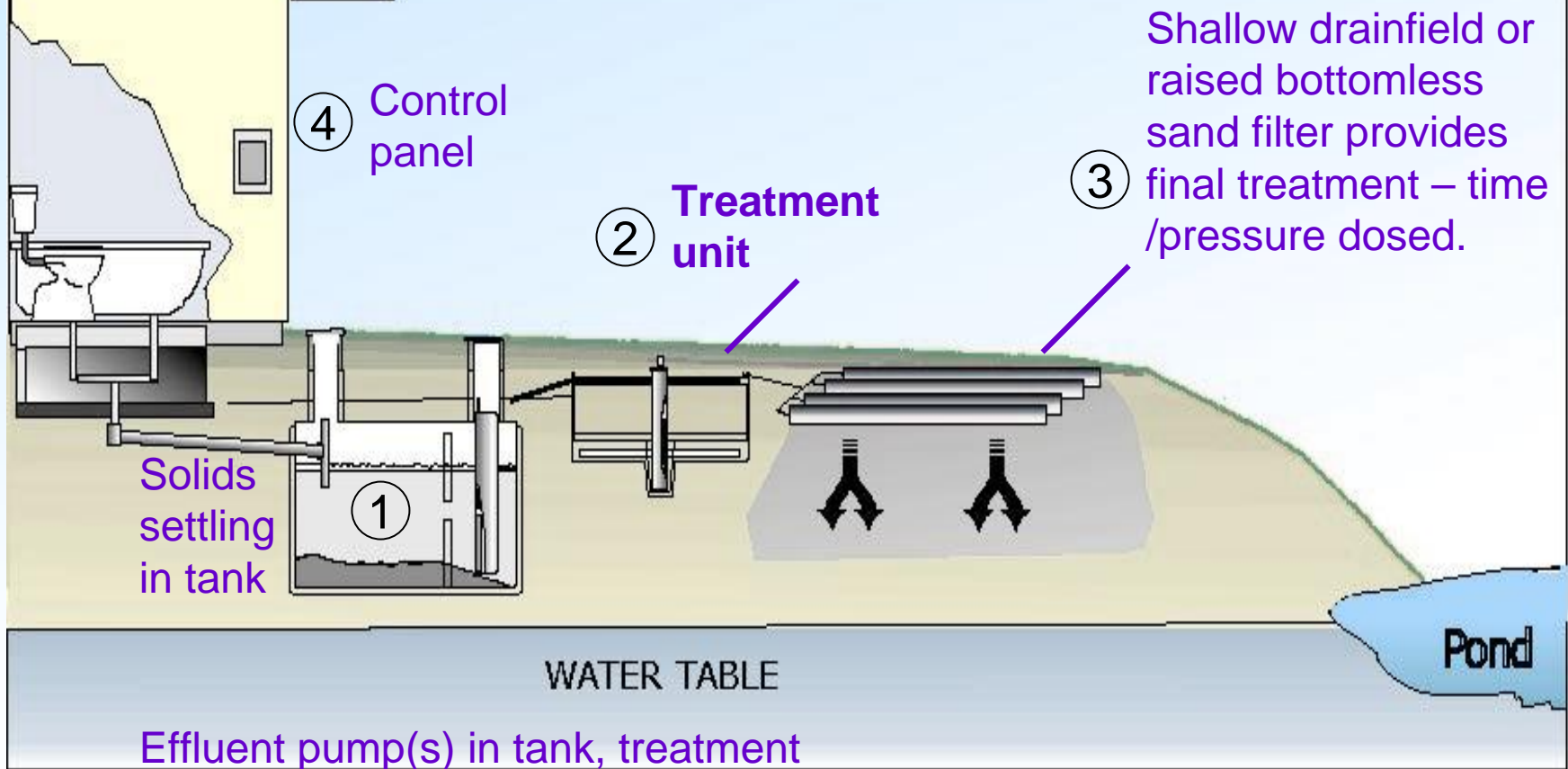
New Construction Issues –

- Reinforces need for large lots
- Conventional treatment may not protect critical resources

Repair Issues

- Alters look of neighborhood, diverts runoff, and can be costly.
- Often approved with variances from minimum setbacks.
- Little protection for wells in densely developed areas.

Alternative Treatment System



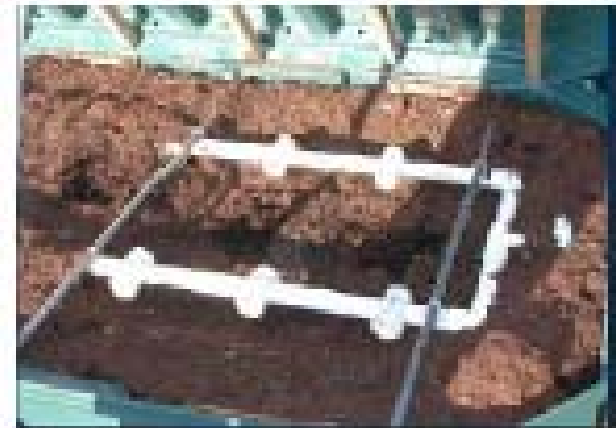
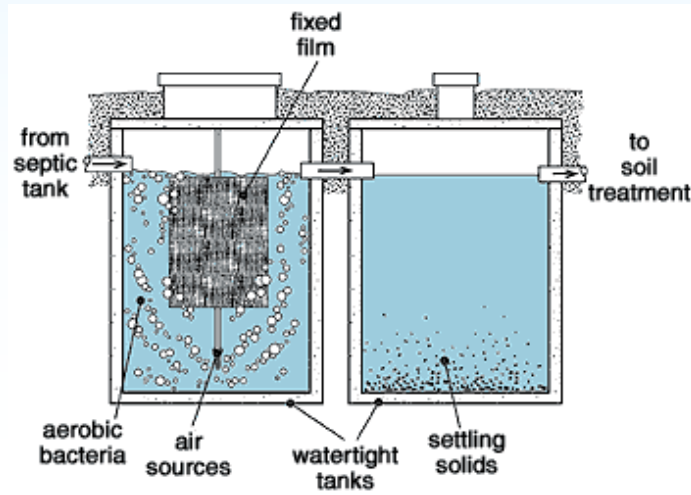
- ④ Effluent pump(s) in tank, treatment unit or separate pump chamber requires timers and control unit.

Treatment Units



Aerobic
treatment units

Filters:
Sand, Foam,
Peat, Textile



Alternative Media:
Foam (top), Peat (middle), and textile (bottom) filters.

Types of Alternative Systems Installed

ca.1985

- RUCK

- ATUs

ca.1996

- Single pass sand filters

- Recirc. sand filters

- Early textile filters

- Foam biofilters

- Shallow narrow pres. drainfields

- Bottomless sand filters - early

- Modular peat filters

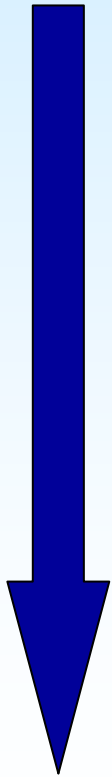
- Textile filters

- Fixed activated sludge systems

- Bottomless sand filters - current

ca.2004

- UV disinfection



Alternative drainfields



Shallow narrow pressure-dosed
Single family & commercial

**Drip
Irrigation**

**Bottomless
sand filter**

Peat filter with shallow pressure dosed drainfield



3-module peat filter



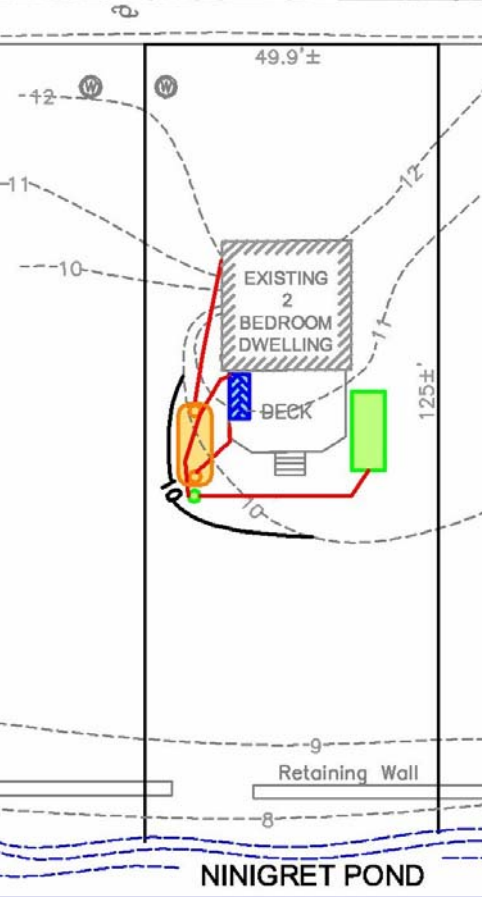
UV filter in pump chamber



Recirculating textile filter with shallow pressure-dosed drainfield



Recirculating textile filter with bottomless sand filter



Waterfront repair
on 5,000 s.f. lot

Performance Summary

URI Onsite Wastewater Training Center Demonstration Systems

Single pass sand and peat filters

- Good BOD, TSS and bacteria reduction, poor N removers
- 40% reduction in total phosphorus with single pass sand filter; minimal in others

Recirculating textile filters

- Most consistent TN removal, came close to the 50% TN removal standard
- Very high beginning N strengths due to water conservation.

Fixed activated sludge system

- Mean TN concentration below standard
- Homeowner complaints due to blower noise, odor and energy use.

Example Annual Operation and Maintenance Costs

Technology	Operating	Inspection and maintenance	Total annual
Textile Blended mode	\$40	\$250	\$290
Or FAS	\$420	\$425	\$845
UV Light	\$35	\$150	\$185
Drainfield – BSF or SNDF	\$15	\$75	\$90
Complete system-Textile	\$90	\$475	\$565
Complete system - FAS	\$470	\$650	\$1,120



**Options for Village Centers and
New Compact Development using
Shared “Cluster” Wastewater
treatment systems**

Onsite alternative to sewers in village centers



Advanced treatment unit in basement of above historical building serves retail at street level and multi-family above, and eliminates direct discharge to coastal waters.

Bottomless sand filter provides at-grade drainfield in alley between buildings.



Chepachet Village Mixed Use Cluster System Repair



2,700 gpd Textile filter and shallow drainfield serves:

- Neighborhood restaurant,
- Duplex apartment,
- Doctor's office, and
- a five-small business strip mall



Multifamily cluster system repair in Chepachet Village

**1200 gpd system serving 3
structures**

- 1. Historic society building**
- 2. 2 bedroom home**
- 3. Apartment building with
six units**

- Each structure has a septic tank and gravity collection in common recirculation tank**



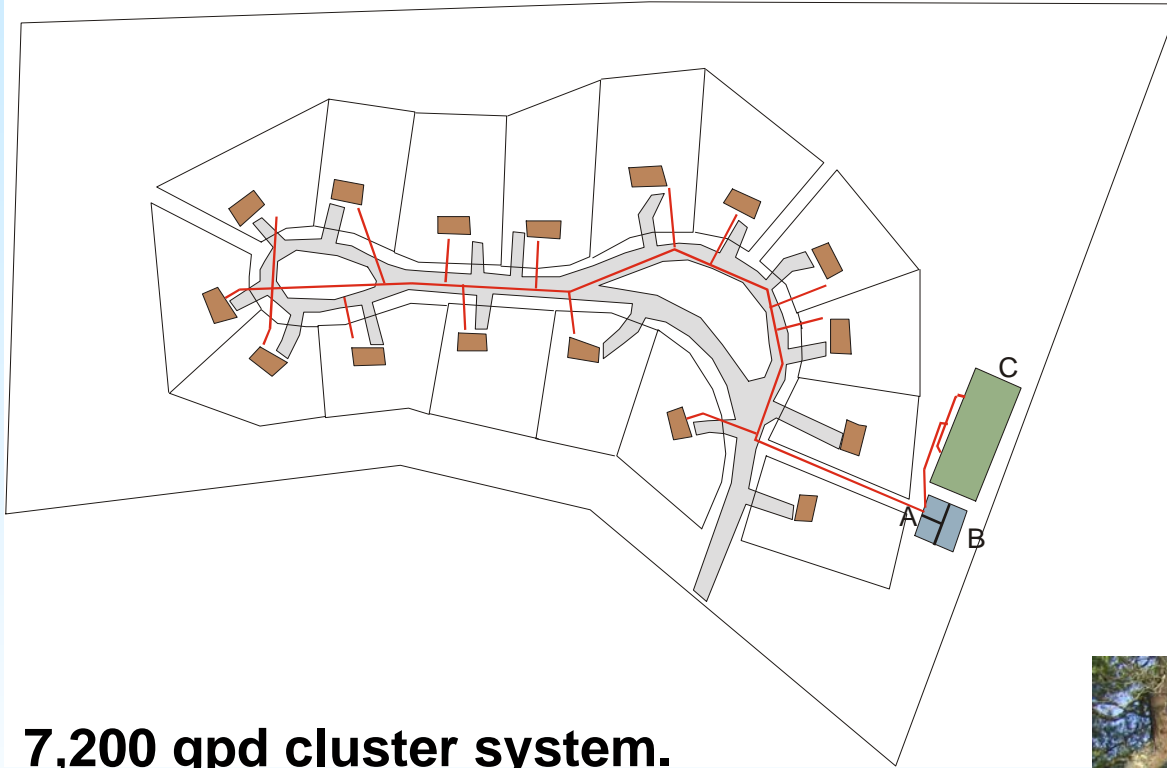
3

6-Unit Apartment Building

From 2 tanks
across the street

- Recirculation tank collects effluent from the three buildings.
- Treatment by two recirculating textile filters (blue covered unit)
- Final dispersal by 7 X 48 foot raised bottomless sand filter

Conservation Subdivision with recirculating sand filter



16 lots; 20,000 sf

**Minimal
disturbance of
steep slopes**

50% open space

Individual wells

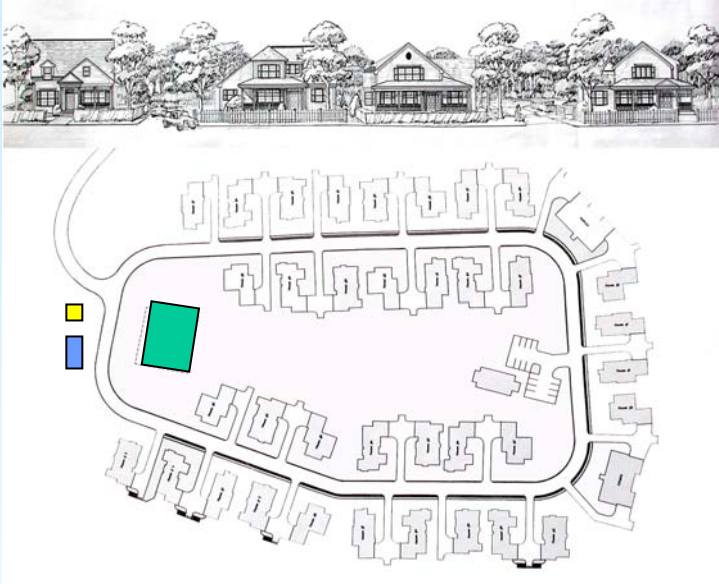
7,200 gpd cluster system.

**Individual septic tanks with effluent
gravity (STEG) flow to common
leachfield.**

**Recirculating media filter designed for
nitrogen removal in gravelly soils.**



New Village Style Development using a *Package* treatment system



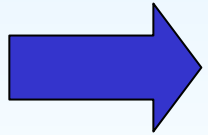
Layout of the Donovan's Farm Conservation Development. The forty homes in the development are gathered along an old-fashioned village street.

Land use: Town of Norwell MA bought a 175-acre estate to preserve historic farmstead; 40 acres developed for senior housing, remainder preserved as open space.

Wastewater treatment: Wastewater pumping to a sequencing batch reactor. Drainfield in town green.

Topics

Overview of alternative technologies – siting, performance, O&M

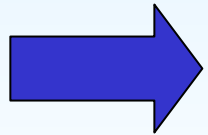


Issues, trends and needs

Funding and Resources

Topics

Overview of alternative technologies – siting, performance, O&M



Issues, trends and needs

Funding and Resources



Conventional “fill” systems used for new construction on high water table, MA. Driveways are at original grade.

Won't using advanced treatment systems open the door to development of unsuitable land?

Reality – marginal sites get developed already using conventional septic systems

The 3 most important factors when using alternative systems



Maintenance

- Annual maintenance contracts with qualified maintenance provider.
- Large systems should demonstrate financial and managerial capacity.

Management

- Oversight by town or county
- Track inspections, O&M, monitoring.
- Web-based tracking is available.

Enforcement

Using Alternative Systems as a Tool for Better Land Use

Start with Wastewater Management plan.

Focus efforts on critical water resources and problem sites.

Create financial / tax incentives for repair of substandard systems using a cluster system.

Specify wastewater treatment performance such as 19 mg/l TN removal; 10 mg/l TN for large flows.

Justify zoning density – cluster to preserve open space or allow development at higher density?

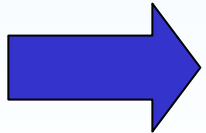
Control development on marginal sites - Integrate standards for stormwater / Wastewater management

Seek professional help in planning, ordinance development and project review.

Topics

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Funding and Resources

Funding Sources

Demonstration projects

- USEPA Block Island Green Hill Wastewater Demonstration Project
- USEPA National Onsite Demonstration Project II
- RIDEM Nonpoint Source Program (Section 319)
- URI Agricultural Experiment Station, Cooperative Extension
- Community Development Block Grants
- Community, industry, private sector partners
- Homeowner share of alternative system repair – 50%

Wastewater Management Plans and Ordinances

- RIDEM Nonpoint Source Program (Section 319)
- EPA Block Island Green Hill Wastewater Demonstration Project

Town Program Operation

General taxes, dedicated septic system fee

Homeowner loans for System repairs and upgrades

RI Clean Water Revolving Fund 2% loans for residents in towns with approved wastewater management plan.



Resources for building local capacity for innovative development design:

RI Department of Environmental Management design manuals, training, and direct technical assistance.



The South County Design Manual illustrates creative development designs that preserve open space, protect water resources, and maintain scenic and historic character.

The Conservation Development Manual provides step-by-step instructions, expanding the classic 4-step design process developed by R. Arendt

Urban Design Manual - *NEW*

**Chepachet Village
Decentralized Wastewater
Demonstration Project**



**Chepachet Village Decentralized
Wastewater Demonstration Project,
prepared by:**

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Education for Municipal Officials and

George Loomis, URI Onsite Wastewater
Training Center

URI Cooperative Extension
Natural Resource Science Department
Kingston, RI

Available at
[www.uri.edu/ce/wq/mtp/html/
publications.html](http://www.uri.edu/ce/wq/mtp/html/publications.html)

Thanks to the town of Glocester, Rhode Island and the
Rhode Island Department of Environmental Management,
Nonpoint Pollution “319” Program for funding this project.



Plans, ordinances, fact sheets on Web

Block Island/ Green Hill Watershed
Wastewater Demonstration Project

[**http://www.uri.edu/ce/wq/**](http://www.uri.edu/ce/wq/)



SAFEWATER

*A community effort to protect, recycle and
sustain local water resources. Funded by EPA*

[**http://www.uri.edu/ce/wq/**](http://www.uri.edu/ce/wq/)

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